

DC-Micromotors

2 mNm

Precious Metal Commutation

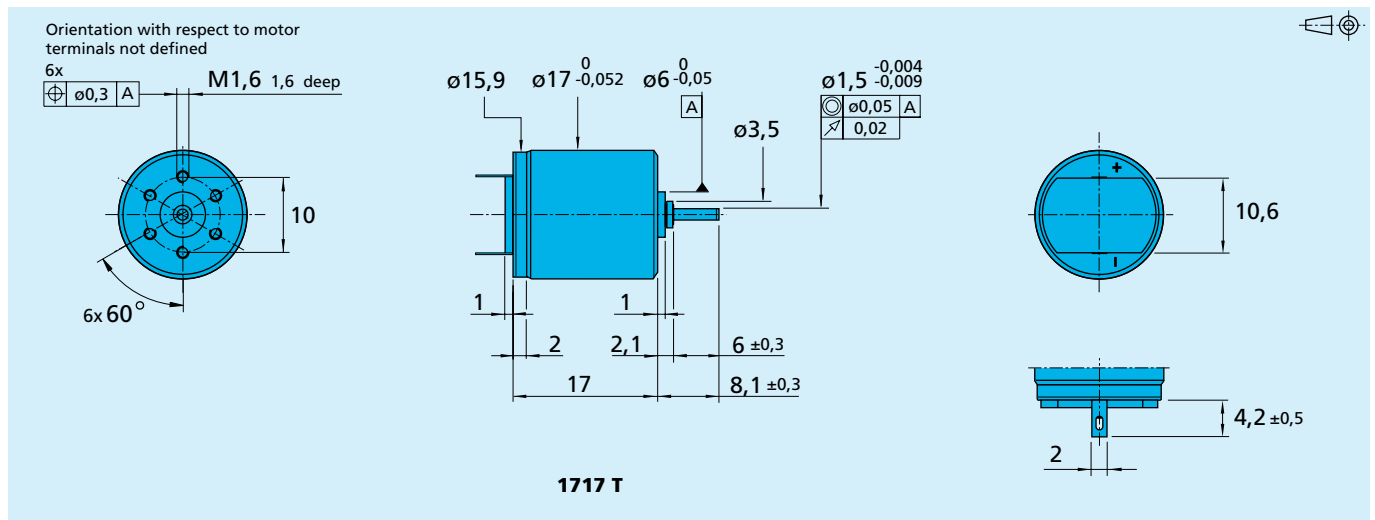
For combination with (overview on page 14-15)

Gearheads:
15A, 16A, 16/7

Encoders:
IE2 – 16 ... 512

Series 1717 ... SR

	1717 T	003 SR	006 SR	012 SR	018 SR	024 SR	
1 Nominal voltage	U _N	3	6	12	18	24	Volt
2 Terminal resistance	R	1,07	4,30	17,1	50,1	68,8	Ω
3 Output power	P _{2 max.}	1,97	1,96	1,97	1,50	1,96	W
4 Efficiency	η _{max.}	69	69	70	68	70	%
5 No-load speed	n _o	14 000	14 000	14 000	12 300	14 000	rpm
6 No-load current (with shaft ø 1,5 mm)	I _o	0,091	0,046	0,023	0,013	0,011	A
7 Stall torque	M _H	5,37	5,34	5,38	4,66	5,36	mNm
8 Friction torque	M _R	0,18	0,18	0,18	0,18	0,17	mNm
9 Speed constant	k _n	4 820	2 410	1 210	709	602	rpm/V
10 Back-EMF constant	k _E	0,207	0,414	0,829	1,410	1,660	mV/rpm
11 Torque constant	k _M	1,98	3,96	7,92	13,50	15,90	mNm/A
12 Current constant	k _I	0,505	0,253	0,126	0,074	0,063	A/mNm
13 Slope of n-M curve	Δn/ΔM	2 610	2 620	2 600	2 640	2 610	rpm/mNm
14 Rotor inductance	L	17	65	260	760	1 040	μH
15 Mechanical time constant	τ _m	16	16	16	16	16	ms
16 Rotor inertia	J	0,59	0,58	0,59	0,58	0,59	gcm ²
17 Angular acceleration	α _{max.}	92	92	92	80	92	·10 ³ rad/s ²
18 Thermal resistance	R _{th 1} / R _{th 2}	4,5 / 27					K/W
19 Thermal time constant	τ _{w1} / τ _{w2}	2,0 / 210					s
20 Operating temperature range:							
– motor		– 30 ... + 85 (optional – 55 ... + 125)					°C
– rotor, max. permissible		+ 125					°C
21 Shaft bearings		sintered bronze sleeves	ball bearings	ball bearings, preloaded			
22 Shaft load max.:		(standard)	(optional)	(optional)			
– with shaft diameter		1,5	1,5	1,5			mm
– radial at 3 000 rpm (3 mm from bearing)		1,2	5	5			N
– axial at 3 000 rpm		0,2	0,5	0,5			N
– axial at standstill		20	10	10			N
23 Shaft play:							
– radial	≤	0,03	0,015	0,015			mm
– axial	≤	0,2	0,2	0			mm
24 Housing material		steel, black coated					
25 Weight		18					g
26 Direction of rotation		clockwise, viewed from the front face					
Recommended values - mathematically independent of each other							
27 Speed up to	n _{e max.}	10 000	10 000	10 000	10 000	10 000	rpm
28 Torque up to	M _{e max.}	2	2	2	2	2	mNm
29 Current up to (thermal limits)	I _{e max.}	1,20	0,60	0,30	0,18	0,15	A



Encoders

Magnetic Encoders

Features:
 64 to 512 Lines per revolution
 2 Channels
 Digital output

Series IE2 – 512

		IE2 – 64	IE2 – 128	IE2 – 256	IE2 – 512	
Lines per revolution	N	64	128	256	512	
Signal output, square wave		2				channels
Supply voltage	V _{DD}	4,5 ... 5,5				V DC
Current consumption, typical (V _{DD} = 5 V DC)	I _{DD}	typ. 6, max. 12				mA
Output current, max. ¹⁾	I _{OUT}	5				mA
Pulse width	P	180 ± 45				°e
Phase shift, channel A to B	Φ	90 ± 45				°e
Signal rise/fall time, max. (C _{LOAD} = 50 pF)	tr/tf	0,1 / 0,1				µs
Frequency range ²⁾ , up to	f	20	40	80	160	kHz
Inertia of code disc ³⁾	J	0,09				gcm ²
Operating temperature range		– 25 ... + 85				°C

¹⁾ V_{DD} = 5 V DC: Low logic level < 0,5 V, high logic level > 4,5 V: CMOS and TTL compatible

²⁾ Velocity (rpm) = f (Hz) x 60/N

³⁾ For the brushless DC-Servomotors 1628 ... B, 2036 ... B and 2444 ... B the inertia of code disc is J = 0,14 gcm²

Ordering information

Encoder	number of channels	lines per revolution	in combination with:
IE2 – 64	2	64	DC-Micromotors series 1336 ... C, 1516 ... SR, 1524 ... SR, 1717 ... SR, 1724 ... SR, 1727 ... C, 2224 ... SR, 2232 ... SR, 2342 ... CR, 2642 ... CR, 2657 ... CR, 3242 ... CR, 3257 ... CR, 3863 ... C
IE2 – 128	2	128	
IE2 – 256	2	256	
IE2 – 512	2	512	
			Brushless DC-Servomotors series 1628 ... B, 2036 ... B, 2057 ... B, 2444 ... B

Features

These incremental shaft encoders in combination with the FAULHABER DC-Micromotors and Brushless DC-Servomotors are used for indication and control of both shaft velocity and direction of rotation as well as for positioning.

The encoder is integrated in the DC-Micromotors SR-Series and extends the overall length by only 1,4 mm. Built-on option for DC-Micromotors and Brushless DC-Servomotors.

Hybrid circuits with sensors and a low inertia magnetic disc provide two channels with 90° phase shift.

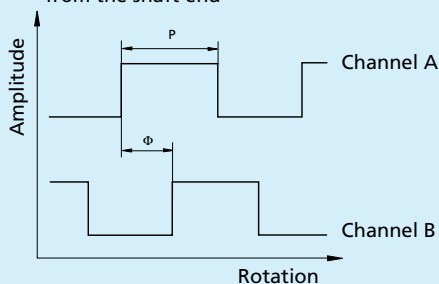
The supply voltage for the encoder and the DC-Micromotor as well as the two channel output signals are interfaced through a ribbon cable with connector.

Details for the DC-Micromotors and suitable reduction gearheads are on separate catalogue pages.

Output signals / Circuit diagram / Connector information

Output signals

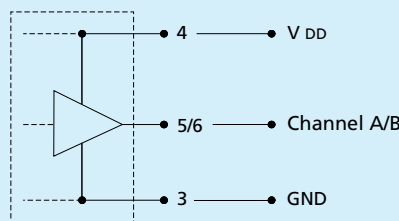
with clockwise rotation as seen from the shaft end



Admissible deviation of phase shift:

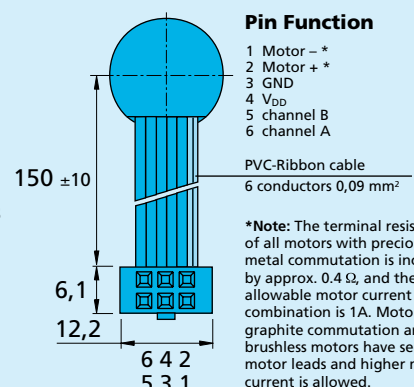
$$\Delta\Phi = \left| 90^\circ - \frac{\Phi}{P} * 180^\circ \right| \leq 45^\circ$$

Output circuit



Pin Function

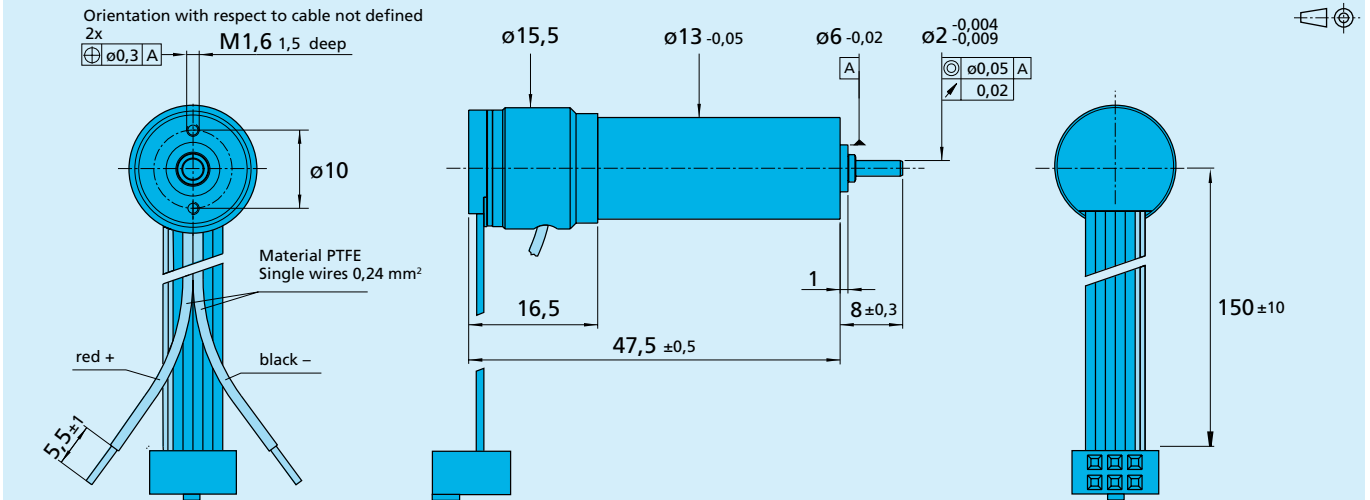
- 1 Motor – *
- 2 Motor + *
- 3 GND
- 4 V_{DD}
- 5 channel B
- 6 channel A



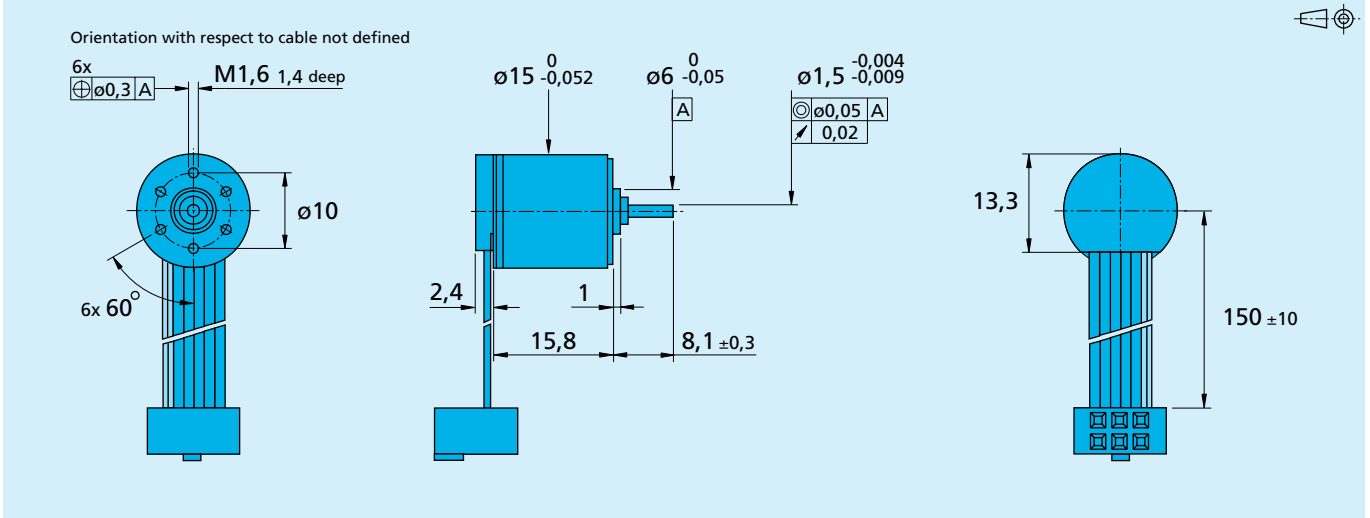
***Note:** The terminal resistance of all motors with precious metal commutation is increased by approx. 0,4 Ω, and the max. allowable motor current in combination is 1A. Motors with graphite commutation and brushless motors have separate motor leads and higher motor current is allowed.

Connector
 DIN-41651
 grid 2,54 mm

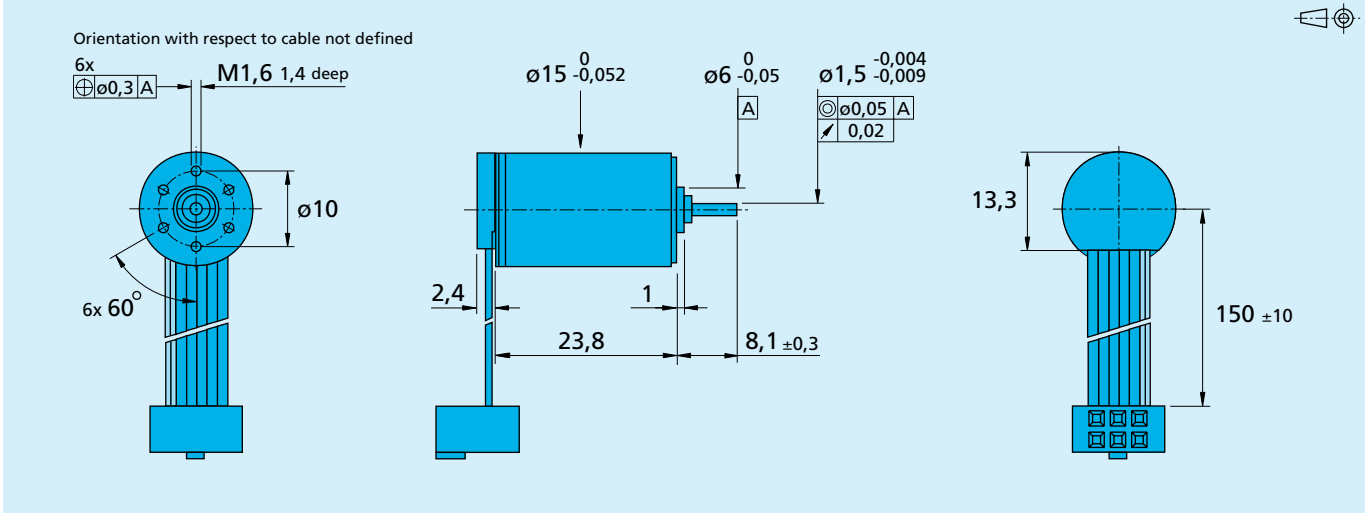
DC-Micromotor 1336 U ... C - 123 with Encoder IE2 – 16 ... 512



DC-Micromotor 1516 T ... SR with Encoder IE2 – 16 ... 512

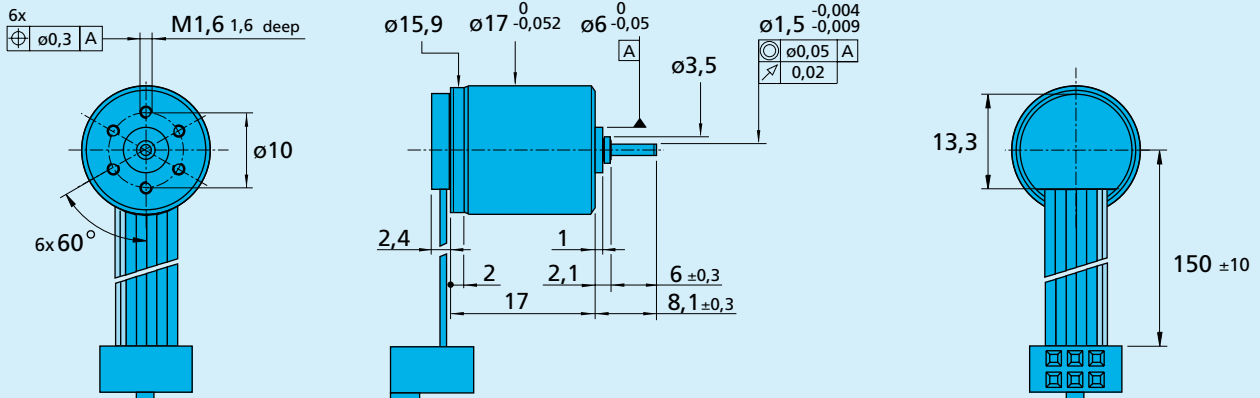


DC-Micromotor 1524 T ... SR with Encoder IE2 – 16 ... 512



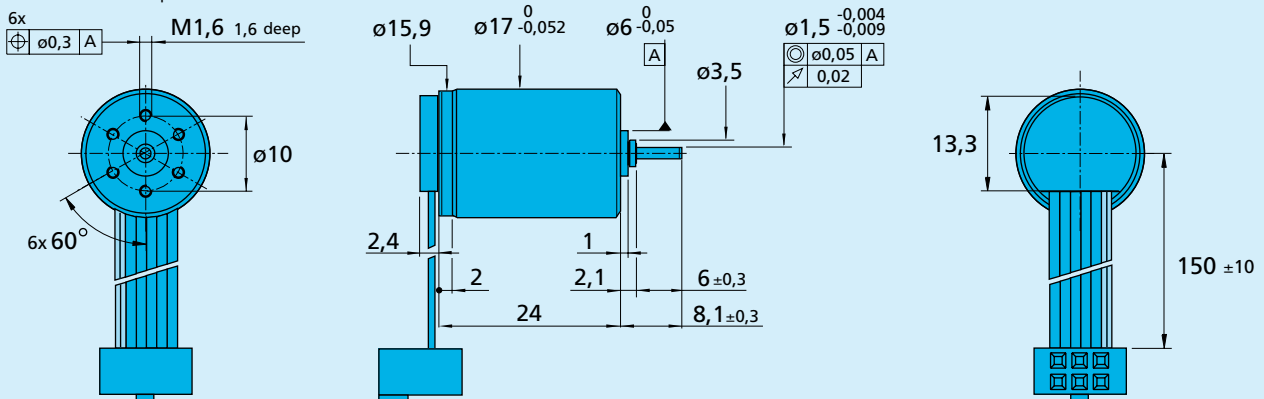
DC-Micromotor 1717 T ... SR with Encoder IE2 – 16 ... 512

Orientation with respect to cable not defined



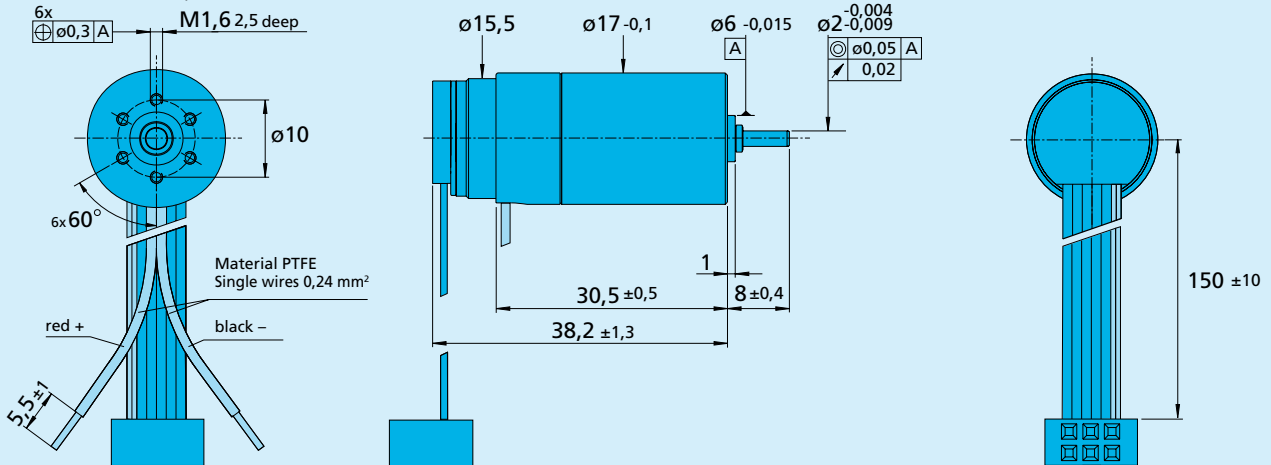
DC-Micromotor 1724 T ... SR with Encoder IE2 – 16 ... 512

Orientation with respect to cable not defined

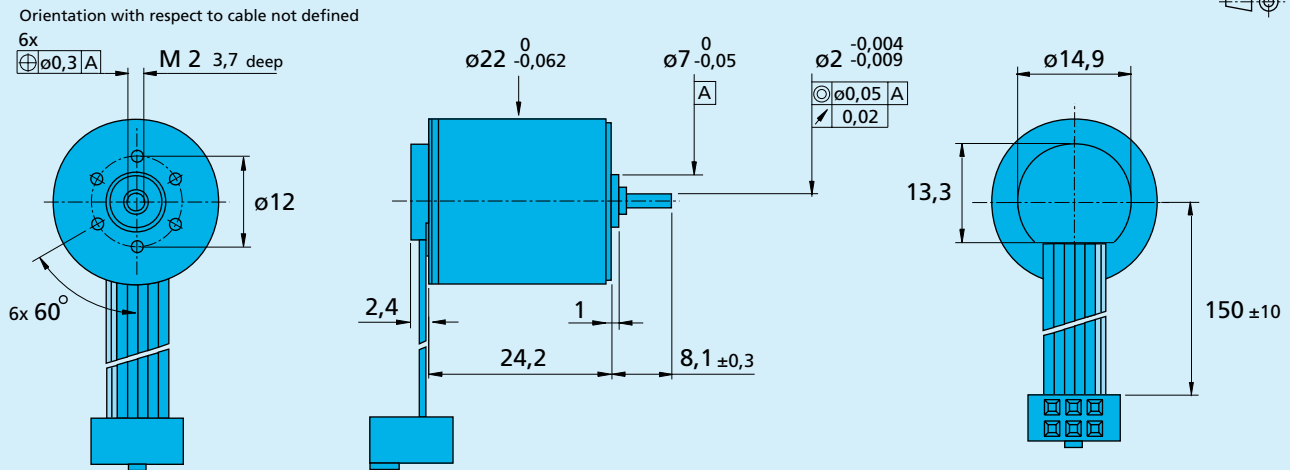


DC-Micromotor 1727 U ... C - 123 with Encoder IE2 – 16 ... 512

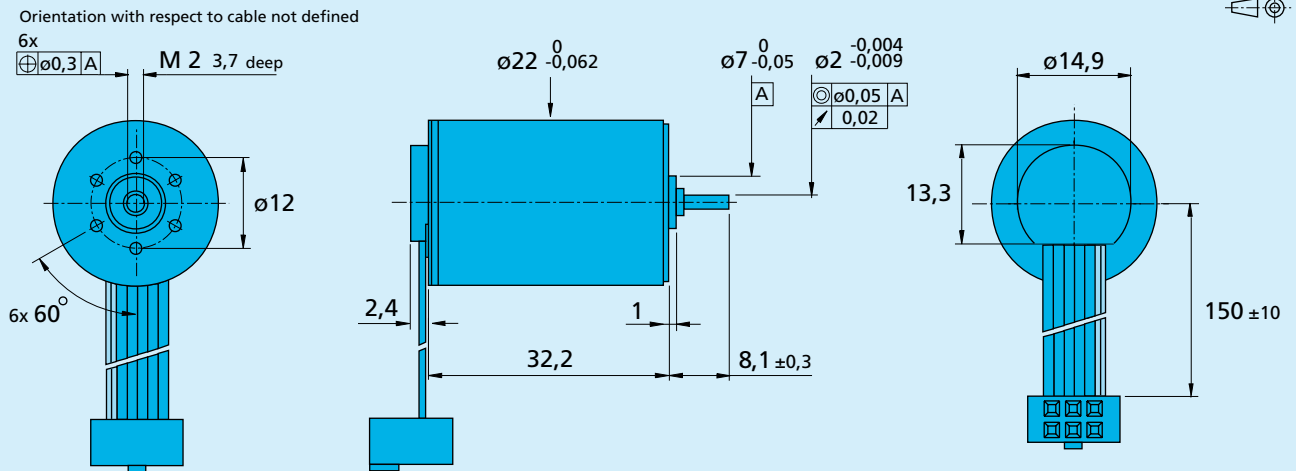
Orientation with respect to cable not defined



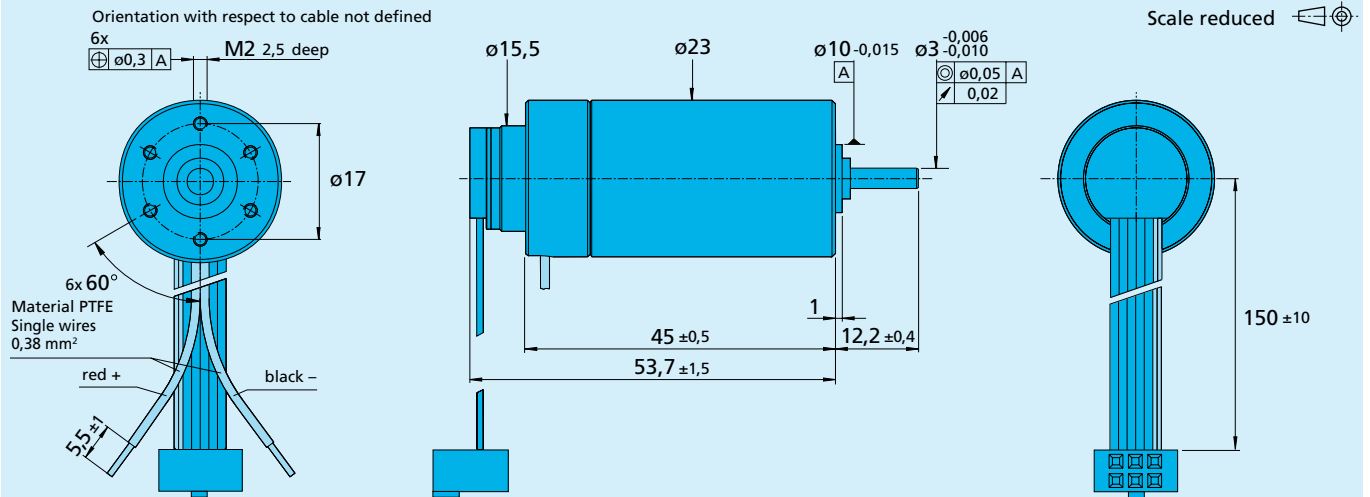
DC-Micromotor 2224 U ... SR with Encoder IE2 – 16 ... 512



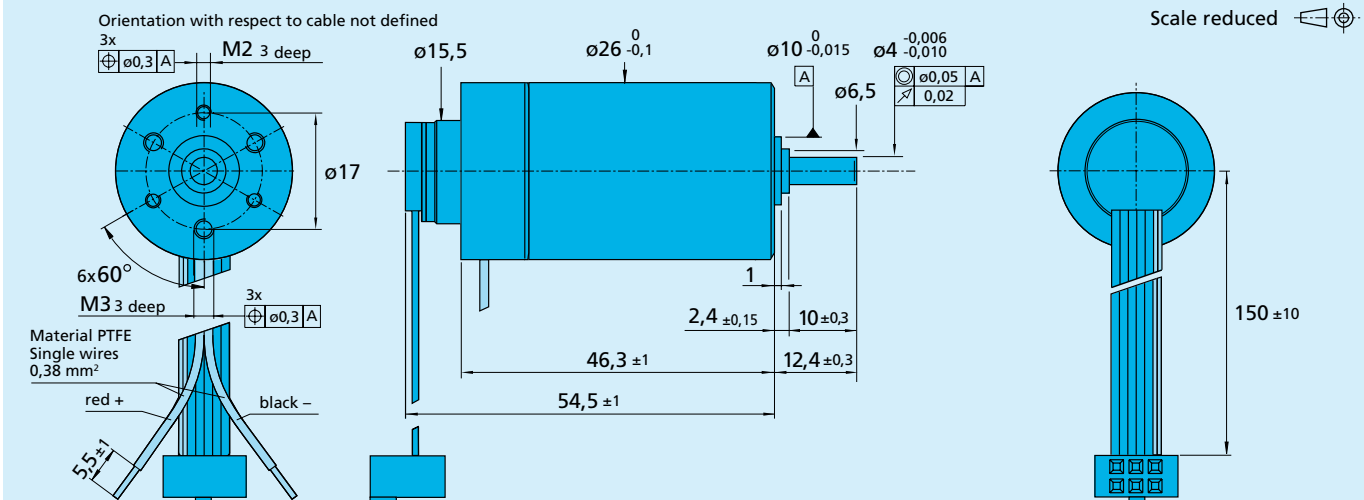
DC-Micromotor 2232 U ... SR with Encoder IE2 – 16 ... 512



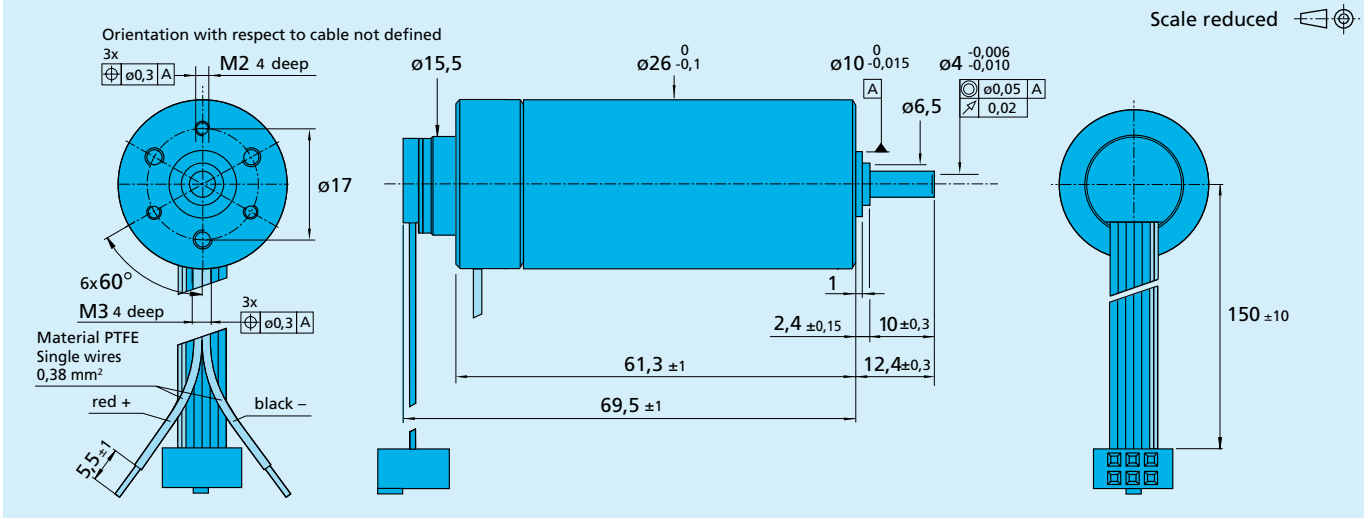
DC-Micromotor 2342 S ... CR with Encoder IE2 – 16 ... 512



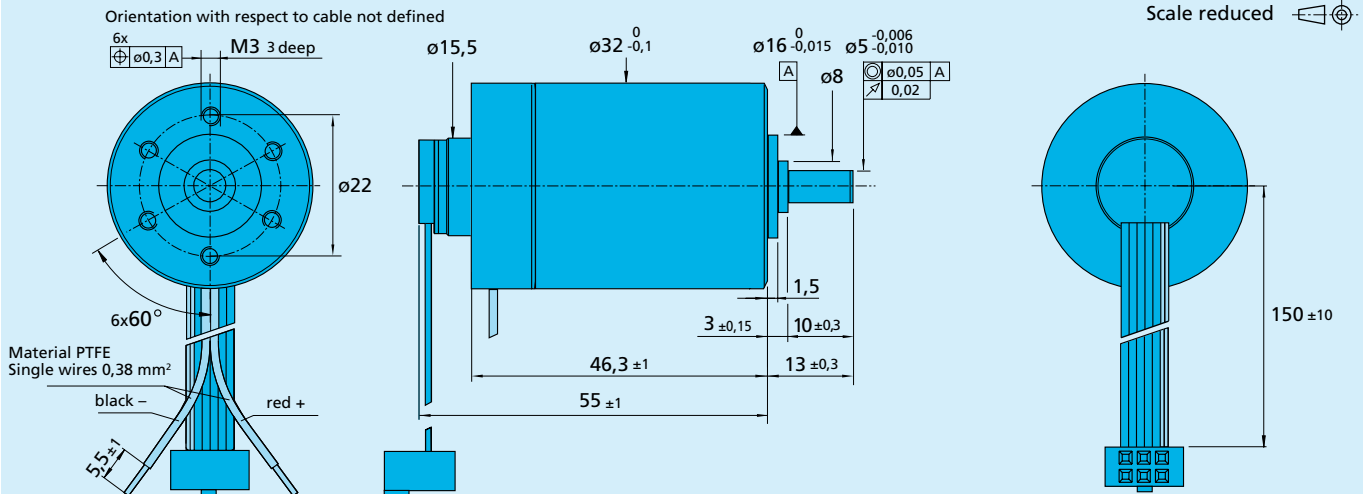
DC-Micromotor 2642 W ... CR with Encoder IE2 16 – 512



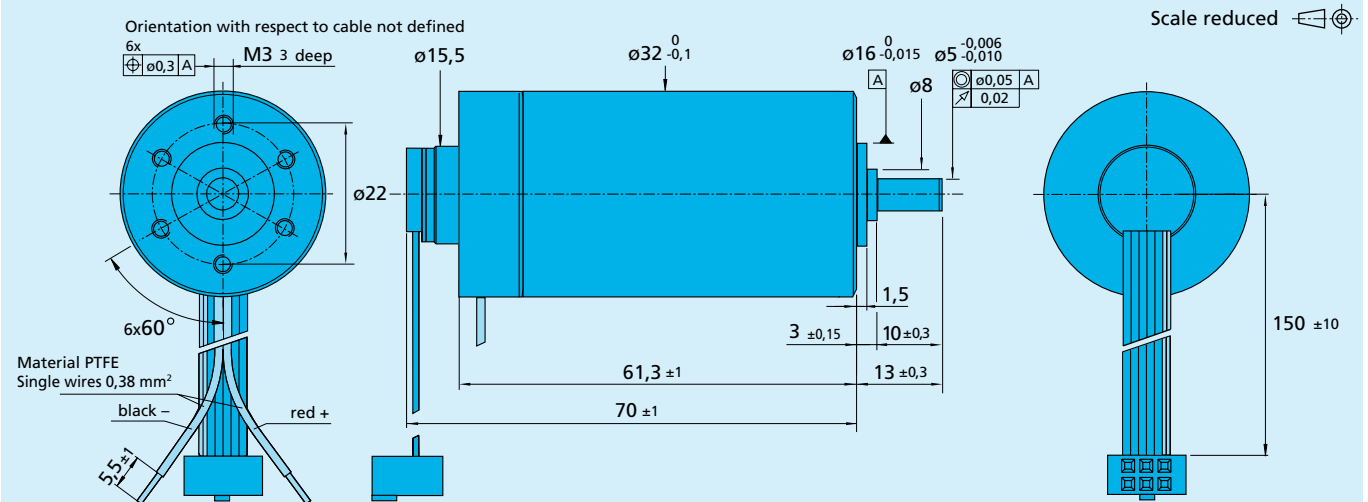
DC-Micromotor 2657 W ... CR with Encoder IE2 16 – 512



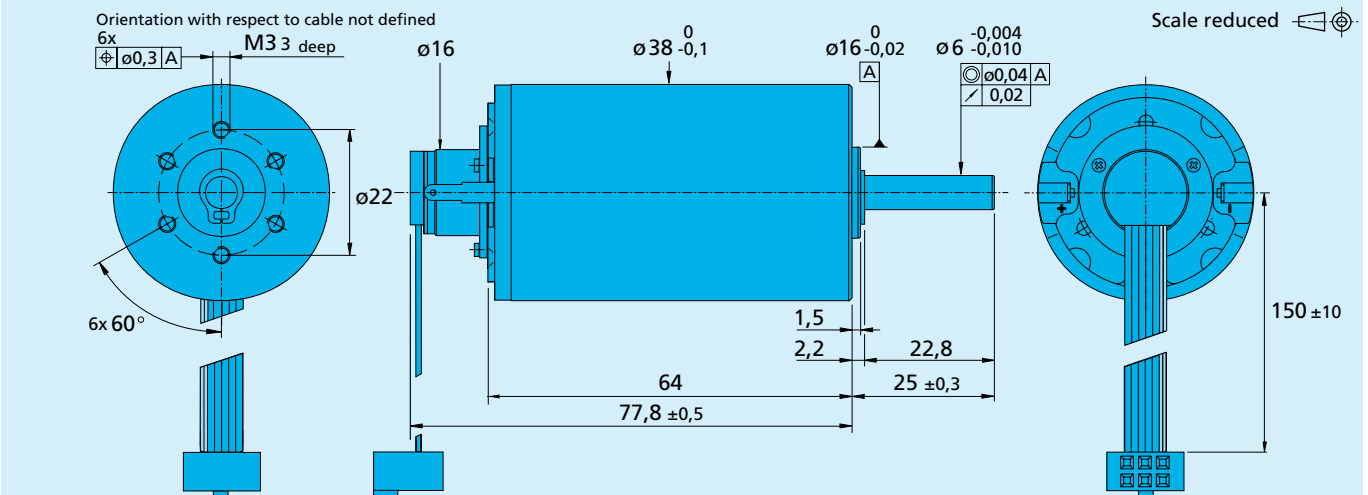
DC-Micromotor 3242 G ... CR with Encoder IE2 16 – 512



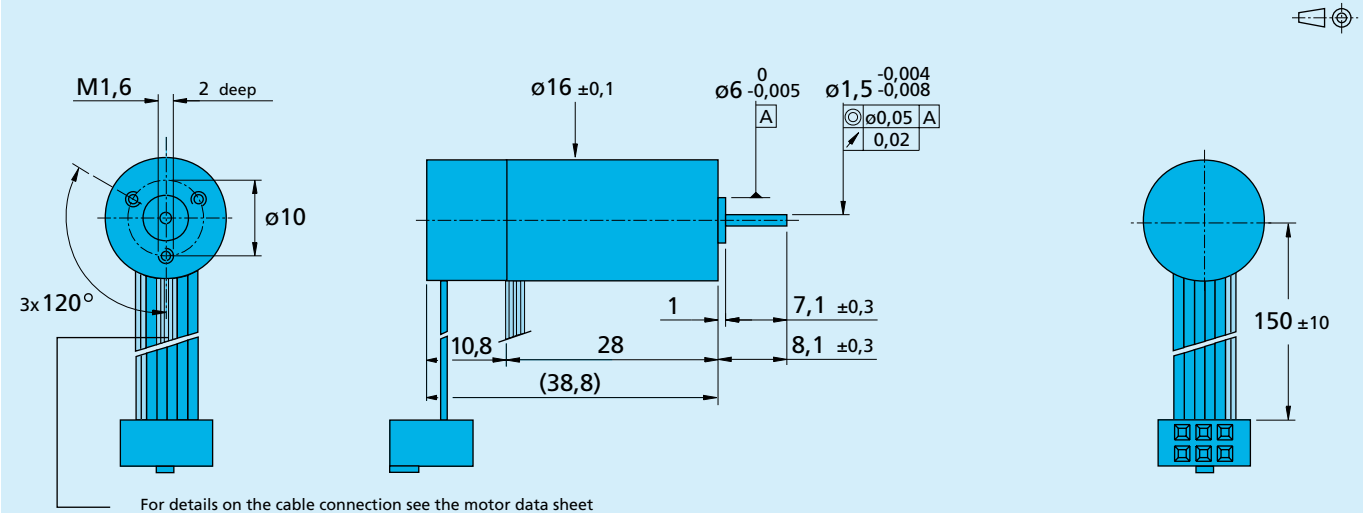
DC-Micromotor 3257 G ... CR with Encoder IE2 16 – 512



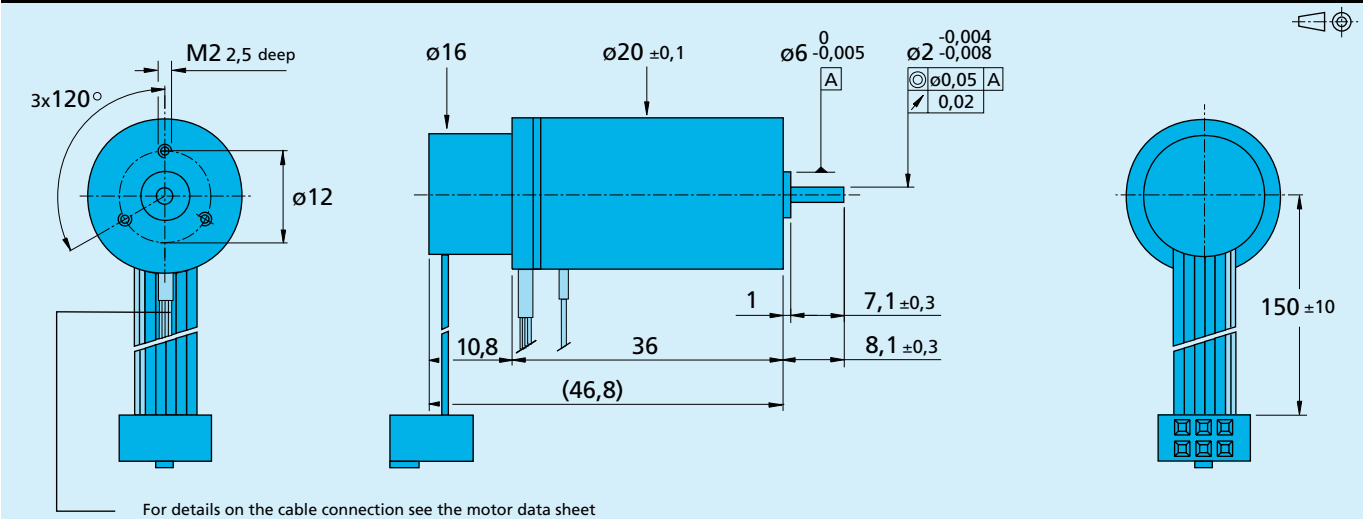
DC-Micromotor 3863 H ... C - 2016 with Encoder IE2 16 – 512



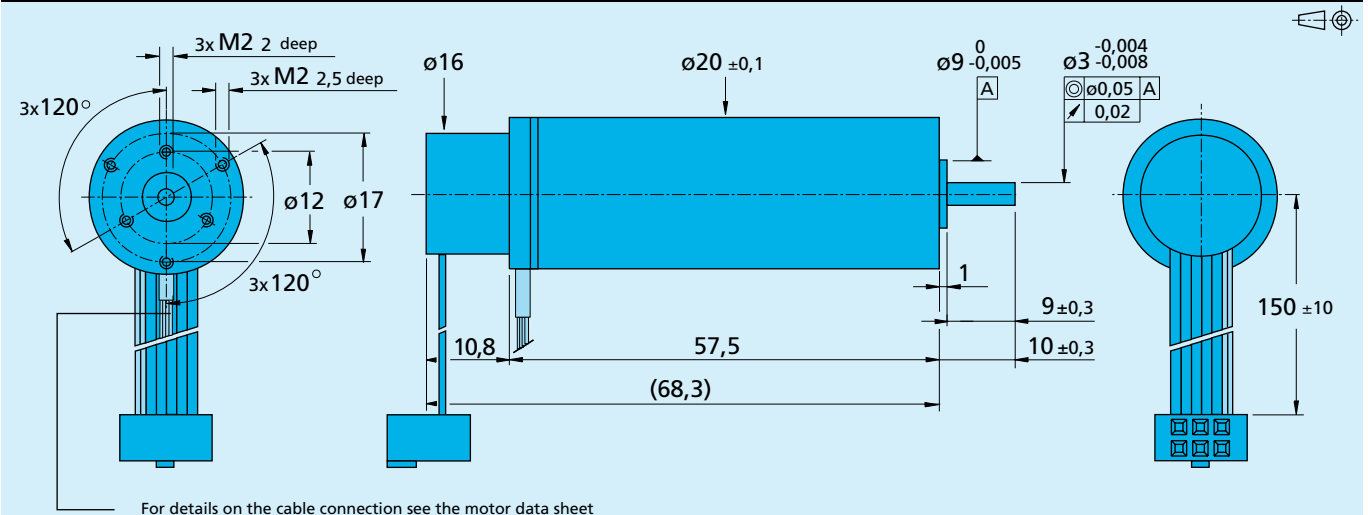
Brushless DC-Servomotor 1628 T ... B - K313 with Encoder IE2 – 16 ... 512



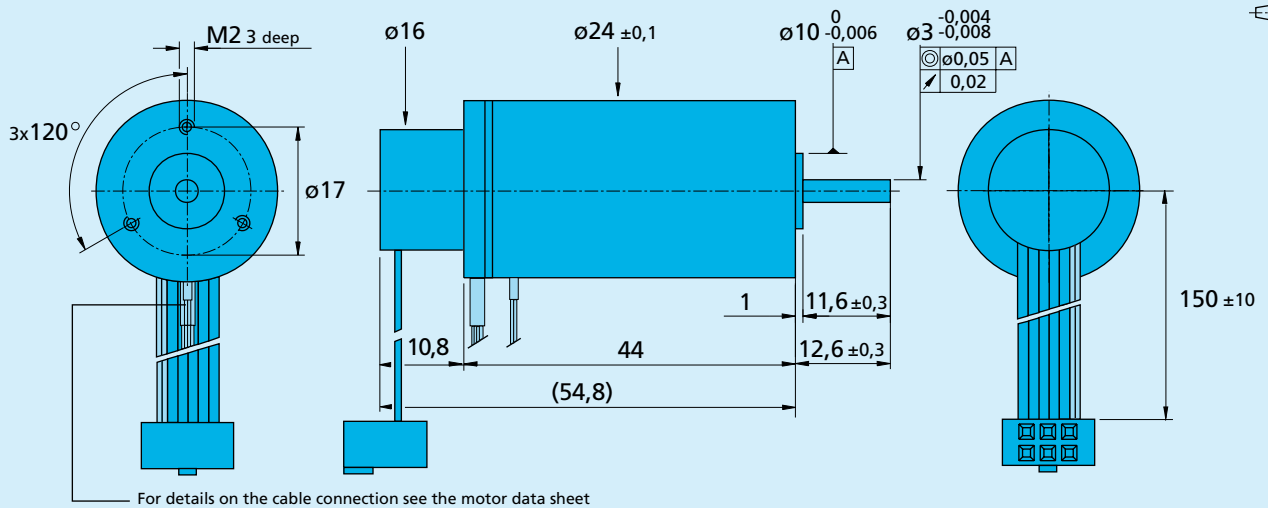
Brushless DC-Servomotor 2036 U ... B - K313 with Encoder IE2 – 16 ... 512



Brushless DC-Servomotor 2057 S ... B - K313 with Encoder IE2 – 16 ... 512



Brushless DC-Servomotor 2444 S ... B - K313 with with Encoder IE2 – 16 ... 512



Planetary Gearheads

0,3 Nm

For combination with (overview on page 14-15)

DC-Micromotors:
1516, 1524, 1624, 1717, 1724, 1727

Brushless DC-Servomotors:
1628

DC-Motor-Tacho Combinations:
1841

Series 16/7

	16/7
Housing material	metal
Geartrain material	all steel
Recommended max. input speed for:	
– continuous operation	5 000 rpm
Backlash, at no-load	≤ 1°
Bearings on output shaft	preloaded ball bearings
Shaft load, max.:	
– radial (6,5 mm from mounting face)	≤ 30 N
– axial	≤ 5 N
Shaft press fit force, max.	≤ 5 N
Shaft play (on bearing output):	
– radial	≤ 0,02 mm
– axial	= 0 mm
Operating temperature range	– 30 ... + 100 °C

Specifications

reduction ratio (nominal)	weight without motor g	length without motor L2 mm	length with motor						output torque		direction of rotation (reversible)	efficiency %
			1516 T	1524 T 1624 T	1628 T	1717 T	1724 T	1727 U	continuous operation M max. mNm	intermittent operation M max. mNm		
3,71 :1	18	17,0	L1 mm	L1 mm	L1 mm	L1 mm	L1 mm	L1 mm	200	300	=	90
14 :1	23	21,2	32,8	40,8	45,0	34,0	41,0	44,2	300	450	=	80
43 :1	28	25,3	36,9	44,9	49,1	38,1	45,1	48,3	300	450	=	70
66 :1	28	25,3	41,1	49,1	53,3	42,3	49,3	52,5	300	450	=	70
134 :1	33	29,4	41,1	49,1	53,3	42,3	49,3	52,5	300	450	=	60
159 :1	33	29,4	45,2	53,2	57,4	46,4	53,4	56,6	300	450	=	60
246 :1	33	29,4	45,2	53,2	57,4	46,4	53,4	56,6	300	450	=	60
415 :1	38	33,5	49,3	57,3	61,5	50,5	57,5	60,7	300	450	=	55
592 :1	38	33,5	49,3	57,3	61,5	50,5	57,5	60,7	300	450	=	55
989 :1	38	33,5	49,3	57,3	61,5	50,5	57,5	60,7	300	450	=	55
1 526 :1	38	33,5	49,3	57,3	61,5	50,5	57,5	60,7	300	450	=	55
2 608 :1	43	37,6	53,4	61,4	65,6	54,6	61,6	64,8	300	450	=	50
4 365 :1	43	37,6	53,4	61,4	65,6	54,6	61,6	64,8	300	450	=	50
5 647 :1	43	37,6	53,4	61,4	65,6	54,6	61,6	64,8	300	450	=	50

Note: The reduction ratios are rounded, the exact values are available on request.

